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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : A62C 5/02, B05B 1/34 — A1

(11) International Publication Number: **WO 00/12177**

(43) International Publication Date: 9 March 2000 (09.03.00)

(21) International Application Number: PCT/NO99/00253

(22) International Filing Date: 12 August 1999 (12.08.99)

(30) Priority Data:
19983690 12 August 1998 (12.08.98) NO

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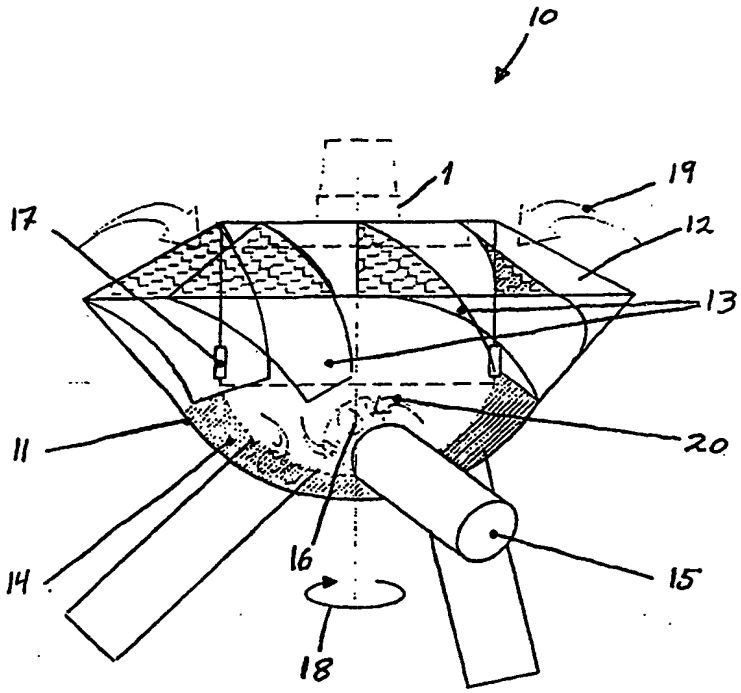
(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.
In English translation (filed in Norwegian).

(54) Title: METHOD FOR PRODUCTION OF A FIRE FIGHTING FOAM, NOZZLE HEAD AND AN ARRANGEMENT IN A FIRE EXTINGUISHING INSTALLATION

(57) Abstract

The invention concerns a method for producing a fire fighting foam, whereby water, gas (e.g. air) and foam fluid are mixed and foamed, wherein the gas is added to the water under pressure before the gas/water mixture is leaving a nozzle for spreading the foam. The invention also concerns a nozzle head, comprising a nozzle head insert (1), which is arranged rotatable, under influence of a water pressure, relative to an inlet stub (4), and at least one outlet pipe, which is a foam pipe (15) and which is in fluid communication with the inlet stub (4) via the nozzle head insert. The foam pipe (15) is at its end facing the nozzle head insert (1) equipped with at least one suction port (16), for taking in air into the foam pipe (15), to produce a fire fighting foam. The suction port (16) is at least partly surrounded by a hood (11), which forms a room or pressure chamber (14) in front of the suction port (16), wherein the room or the pressure chamber has an open side facing in the direction of rotation of the nozzle head insert (1), whereby air is forced into the room or pressure chamber (14) during the rotation of the nozzle head insert (1), and an arrangement in a fire extinguishing installation, comprising a nozzle head insert (1), which is arranged rotatable, under influence of a water pressure, relative to an inlet stub (4), on the nozzle head insert at least one nozzle in fluid communication with the inlet stub (4) via the nozzle head insert is arranged. The arrangement also comprises a gas source, which is coupled to a water source for introduction of the gas into the water under pressure.



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METHOD FOR PRODUCTION OF A FIRE FIGHTING FOAM, NOZZLE HEAD AND AN ARRANGEMENT IN A FIRE EXTINGUISHING INSTALLATION.

The present invention regards a method for manufacture of a fire retarding foam, whereby water, gas (e.g. air) and foam fluid is mixed and foamed, a nozzle head, comprising a nozzle head insert, which is arranged in such a manner so as to be rotatable under the influence of water pressure, relative to an inlet piece, and at least one outlet pipe, which is a foam pipe and which is in fluid communication with the inlet piece via the nozzle head insert, where the foam pipe, at the end which faces the nozzle head insert, is provided with at least one suction port for intake of air to the foam pipe, in order to produce a fire retarding foam and an arrangement at a fire extinguishing installation, comprising a nozzle head insert, which is arranged in such a manner so as to be rotatable under the influence of water pressure, relative to an inlet piece, on which nozzle head insert is provided at least one nozzle, which is in fluid communication with the inlet piece via the nozzle head insert.

A nozzle head as mentioned above is essentially known from SE 362,793, in which is shown a foam pipe that has inlet ports at the rear, for drawing in air through a venturi effect. The air mixes with the fluid, and is ejected as a foam.

Examples of other known fire extinguishing devices:

Norwegian patent no. 124,575 discloses a fire extinguisher with several nozzles provided on a nozzle head, and in which combustion gas is sucked into a cavity in a shell and then led out of this together with the extinguishing water. The combustion gases are sucked in through an opening in which is arranged vanes in order to further improve the suction capacity, and into a cup-shaped compartment. The water nozzles extend through this compartment. The orifices in the water nozzles end immediately in front of openings formed in the cup-shaped compartment. When water pressure is applied, this will act to create underpressure in the cup-shaped compartment, which will draw the smoke out of this. There is no description of any foam being formed by this fire extinguishing device.

NO 176,748 discloses a spray nozzle for fire extinguishing. Due to the inclined arrangement of the nozzle channels relative to the circumference of the nozzle head, the nozzle will rotate when water pressure is applied. During fire-fighting, the water will be atomised, but no formation of foam has been described.

NO 179,735 also discloses a nozzle for fire extinguishing, where a whirling device is arranged in each nozzle, which whirling device rotates under water pressure in order to

hurl the water out with a strong turbulence, thereby achieving a water fog. Foam formation is not described here either.

US 5,284,298 shows a rotatable nozzle head for hosing, which is intended for cleaning purposes, and not fire extinguishing. Between the supply pipe and the nozzle pipe is shown a gap that at first seems to be arranged for air intake, however the role of this is to accommodate movements due to expansion of the material, and it should be as small as is practical. Orifices outside of this gap are there to release accumulated fluid and leaks. It is not intended that air be drawn in through these orifices and the gap.

NO 177,455 shows a rotating nozzle head comprising four nozzles arranged at right angles to each other, wherein the nozzle head rotates due to the reaction force of the water. A fan is mounted on the axle of the nozzle head, which fan draws air down towards the nozzles. A foam net is provided outside of the nozzles. When the air-liquid mixture hits the foam net, foam is formed..

US 3,428,131 discloses a device that is very similar to the device in NO 177,455. This also includes a rotating nozzle head, a fan and a foam net. The most significant difference is the direction of foam ejection.

Foaming additives were at one time introduced for the purpose of creating a barrier between the burning material and the surrounding air, i.e. to keep out the oxygen, which is one of the three elements that are required to sustain a fire. The foaming agents, formerly called foam fluid, were at first made from boiled slaughterhouse waste, which gave off a terrible smell. These days, these agents are largely produced synthetically. 25-30 years ago, the so-called AFFF (A-trippel-F) fluids appeared, "Aquous Film Forming Foam", and these are still considered to be the best in the market. As is suggested by the name, the foam from these fluids form a film or membrane that covers the burning material after the foam itself has dried up, so as to protect against ingress of oxygen and prevent a fresh outbreak of the fire for hours and days after the fire has been put out.

The AFFF liquids are now tailored to several types of fires. Among the more recent in the market is the well known Universal Gold 3% AR-AFFF, made especially for fighting fires involving hydrocarbons and alcohols. As is suggested by the name, this is a liquid that is mixed in a 3% ratio with water. Concentrates that are mixed in 6% and 1% ratios with water also exist, however 3% is the most common. A foam mixing unit

is used to add the foam concentrate to water that is on its way to the nozzle, thus forming the foam. This mixer is normally of the ejector type, which sucks up the foam concentrate and mixes it with water after having been pre-set to the correct mixing ratio. The mixture is mixed with air in the nozzle itself.

The object of the present invention is to provide a method and fire fighting means that, in all parts of a room showing signs of fire, efficiently distribute fire fighting foam automatically, quickly and evenly.

According to the method, this is achieved by adding the gas (e.g. air) to the water under pressure before the gas/water mixture leaves a nozzle for spreading of the foam. In this manner, an increased volume of foam is achieved compared with prior art devices.

A nozzle head is further achieved according to the invention, by the suction port at least partially being surrounded by a hood that forms a compartment or pressure chamber in front of the suction port, the compartment or pressure chamber having an open side that faces the direction of rotation of the nozzle head insert, whereby air is forced into the compartment or pressure chamber during the rotation of the nozzle head insert.

An arrangement at a fire extinguishing installation is also achieved according to the invention, by it also comprising a gas source connected to a water source for introducing gas into the water under pressure. The gas is preferably an inert gas and causes a significant increase in the foam volume.

The rotation of the nozzle is provided by at least one, preferably several foam pipes being attached to a rotatably supported nozzle head insert. These foam pipes are placed at a defined radial distance from and at an angle to the linear axis of the nozzle head insert, and thus the water pressure will cause the nozzle head to rotate.

The foam is formed by air being pulled into the water/foam fluid mixture in the foam pipe. The air stream thus enhanced effects a significant increase in the intensity of the foam production, leading to a considerable improvement in the performance of the nozzle head. A relatively light foam with a long degradation time is produced, decreasing the risk of post-ignition and giving less water damage.

In a preferred embodiment, the nozzle head is provided with a bell-like blade casing, which defines a pressure chamber between the nozzle head insert and the blade casing.

The air suction ports going to the foam pipes are in communication with this pressure chamber, and the blade casing is, at its suction port arranged about the circumference of the nozzle head insert, provided with a plurality of blades facing the direction of rotation. Thus, air is sucked into the pressure chamber, increasing the pressure and forcing larger amounts of air into the foam pipes.

The invention will now be explained in greater detail, with reference to the accompanying drawings, in which:

Figure 1 shows a nozzle head insert;

Figure 2 schematically shows a complete nozzle head according to a preferred embodiment of the invention;

Figures 3 and 4 show a side view and a plan view respectively of an alternative embodiment of the invention;

Figure 5 shows a further alternative embodiment of the present invention.

Figure 1 shows a nozzle head insert 1 comprising a nozzle casing 2, a bearing house 3 and an inlet piece 4. Ball bearings 5 (alternatively sleeve bearings) are provided between the bearing house 3 and the inlet piece 4, so as to enable the nozzle head insert 1 to rotate in relation to the inlet piece 4. A check nut 6 keeps the nozzle head insert 1 in position on the inlet piece 4, in addition to which a gasket 7 has been provided in order to prevent water from penetrating to the bearings 5.

Figure 2 shows a complete nozzle head 10. Here, the nozzle head insert 1 is indicated in broken lines. A predominantly bell-shaped blade housing 11, with an opening 12 running around the nozzle head insert 1, is screwed onto the outside of the nozzle head insert 1 by means of screw thread 17 or attached by other appropriate means. In this opening is provided a plurality of blades 13, all deflected in the same peripheral direction. A compartment or pressure chamber 14 is defined between the blade housing 12 and the nozzle head insert 1.

A plurality of foam pipes 15 extend through openings (not shown) in the blade housing 12 and are screwed into a threaded opening (not shown) in the nozzle head insert 1, which is in communication with a chamber 8 (see Figure 1) in the nozzle head insert.

The foam pipes are provided with a plurality of suction ports 16 at their inner ends, which face the nozzle head insert, which ports are in communication with the pressure chamber 14. The foam pipes 15 are inclined with respect to the central axis of the nozzle head insert 1, and face the opposite peripheral direction from the blades 13.

The function of the nozzle head will now be explained in greater detail. When water pressure is applied through the inlet piece 4, water flows into the chamber 8 and out into the foam pipes 15. Due to the inclination of the foam pipes 15, the nozzle head will start rotating in the direction of the arrow 18. As the blades 13 are deflected in this direction, they will start sucking air in through the opening 12, as indicated by the arrow 19. The air that is sucked in effects a pressure increase in the pressure chamber 14, thus forcing the air in through the suction ports 16 in the nozzle pipes 15, as indicated by the arrow 20. The mixture of water, foam concentrate and air causes vigorous foam formation in the foam pipes 15, such that when this mixture reaches the foam pipe outlets, it will be dispersed across the room as a light foam with a long degradation time. This foam will, due to its long degradation time, have a significantly better smothering effect on the fire than e.g. a water fog, which will only act for a few seconds. The foam will in an efficient manner prevent the fire from flaring up again after having been put out. The water consumption is also reduced considerably, thereby also reducing or even eliminating water damage.

Figures 3 and 4 show an alternative embodiment of the invention. Figure 3 shows a side view of the nozzle head 10, and figure 4 shows a plan view of the nozzle head 10, with the nozzle head insert 1 only indicated in broken lines.

In this embodiment, each of the foam pipes 15 are provided with a hood 21 immediately in front of the suction ports 16. The hood 21 is conical, and fits tightly around the foam pipe 15, while the opposite end, with the greater diameter, is open. Thus, an open compartment or pressure chamber 14 is formed inside the hood 21. The open end of this compartment 14 faces the direction of rotation of the nozzle head 10. Thus, when the nozzle head rotates, the hoods 21 will "collect" air, so as to form an air cushion in the compartment 14 within the hood 21. As such, the pressure inside the compartment or pressure chamber 14 will be slightly higher than outside. The elevated pressure around the suction ports 16 allows more air to be sucked in through the suction ports 16. This increases the efficiency of the foam formation.

The nozzle head according to the present invention can easily be mounted in an existing fire extinguishing installation, such as a sprinkler system, as the pipe piece 4 can be screwed in to replace an existing nozzle.

The nozzle head may also be mounted on e.g. a fire hose for domestic use, and may thereby also be used with hand-held equipment.

A further alternative embodiment of the present invention will now be described with reference to Figure 5, which schematically shows this alternative embodiment.

Figure 5 shows a nozzle 22 that is connected to a foam mixer 23, e.g. of the venturi type. The foam mixer 23 is further connected to a foam fluid receptacle (AFFF) 24 and, via tubing, to a water tank 25. The water tank 25 is connected to a gas cylinder 27 through a shut-off valve 26, which cylinder contains gas, for instance pressurised nitrogen or CO_2.

A smoke detector 28 and a flame detector 29 are connected to the shut-off valve through a control unit 30. This embodiment of the present invention operates as follows:

The smoke detector 28 and/or the flame detector 29 registers signs of fire. This results in a signal passing from these to a control unit 30 that opens the valve 26. When the valve 26 opens, gas flows from the gas cylinder 27 into the water tank 25. The pressure from the gas causes water and gas to flow out through the tubing 31 to the foam mixer 23. Here, foam fluid is drawn out of the foam fluid receptacle 24, among other things because of the venturi effect. The mixture flows out through the nozzle 22 and quickly expands to a foam. The nozzle 22 is arranged rotatably on a nozzle head in an appropriate manner.

The water in the water tank 25 may be pre-mixed with gas, in order to increase the gas content of the water. If the water is not mixed with gas in advance, gas from the gas cylinder 27 will rapidly flow into the water tank in such a manner as to quickly mix with the water, for instance by leading the gas in through the bottom of the water tank 25.

By applying the above mentioned embodiment, a fire extinguishing installation may be installed in places where there is no access to water from the mains. However, this embodiment may also be applied to situations where water from a waterworks is used,

in which case the water mixes with the gas before the mixture is lead to the nozzle 22. This may, as an example, be implemented by filling water in two or more water tanks, into which the gas is subsequently led. When one tank is empty, this will be refilled.

Due to the high spraying capability and throw of the nozzle, which may get up to 5 to 10 metres, it is not necessary to mount this in the ceiling; it may equally well be mounted on a wall. Neither is it required that the nozzle be installed centrally in the room, as two nozzle heads located in separate corners effectively will cover the room. The nozzle heads may therefore be installed in a manner that does not cause inconvenience.

Claims

1.

Method for producing a fire retarding foam, in which water, gas and foam fluid are mixed and foamed, w h e r e i n the gas is added to the water under pressure before the gas/water mixture leaves a nozzle for the foam to be spread.

2.

Method according to Claim 1, w h e r e i n the gas is added to the water from a high-pressure gas cylinder.

3.

Method according to Claim 2, w h e r e i n the water is stored in a water tank, and the water is pre-mixed with a certain amount of gas.

4.

Method according to Claim 1, w h e r e i n the gas is ambient air that is forced into the water.

5.

Nozzle head, comprising a nozzle head insert (1), which is arranged so as to be rotatable under the influence of water pressure, relative to an inlet piece (4), and at least one outlet pipe, which is a foam pipe (15) in fluid communication with the inlet piece (4) via the nozzle head insert, where the foam pipe (15), at the end facing the nozzle head insert (1), is provided with at least one suction port (16) for intake of air into the foam pipe (15), in order to produce a fire retarding foam, w h e r e i n the suction port (16) at least partly is enclosed by a hood (11) that forms a compartment or pressure chamber (14) in front of the suction port (16), the compartment or pressure chamber having an open side facing the direction of rotation of the nozzle head insert (1), so as to force air into the compartment or pressure chamber (14) on rotation of the nozzle head insert (1).

6.

Nozzle head according to Claim 5, w h e r e i n the compartment or pressure chamber (14) is formed by a blade housing (11) provided on the nozzle head insert (1).

7.
Nozzle head according to Claim 6, w h e r e i n the blade housing (11) has an opening (12) that runs around the nozzle head insert (1), and wherein a plurality of blades (13) is provided in this opening (12), which blades are oriented in the direction of rotation of the nozzle head insert (1).

8.
Nozzle head according to Claim 5, w h e r e i n each foam pipe (15) is equipped with a hood (21) that forms a mantle in the area surrounding the suction port (16), which mantle expands in the direction of rotation of the nozzle head and has an opening facing the direction of rotation.

9.
Nozzle head according to Claim 7 or 8, w h e r e i n the foam pipe (15) is inclined with respect to the central axis of the nozzle head (1), in a direction opposite of that of the rotation of the nozzle head (10).

10.
Arrangement at a fire extinguishing installation comprising a nozzle head insert (1) arranged so as to be rotatable under the influence of water pressure, relative to an inlet piece (4), on which nozzle head insert is provided at least one nozzle that is in fluid communication with the inlet piece (4) through the nozzle head insert,
w h e r e i n is also included a gas source for injection of gas into the water under pressure.

11.
Arrangement according to Claim 10, w h e r e i n the water source is a water tank.

12.
Arrangement according to Claim 10 or 11, w h e r e i n the gas source is connected to the water source via a valve, which is assigned to a fire sensor unit that will automatically open the valve upon detecting a fire, in order to release gas into the water.

13.

Arrangement according to Claim 11 or 12, w h e r e i n the water is pre-mixed with a certain amount of gas.

14.

Arrangement according to one of the Claims 10 – 13, w h e r e i n the gas is an inert gas.

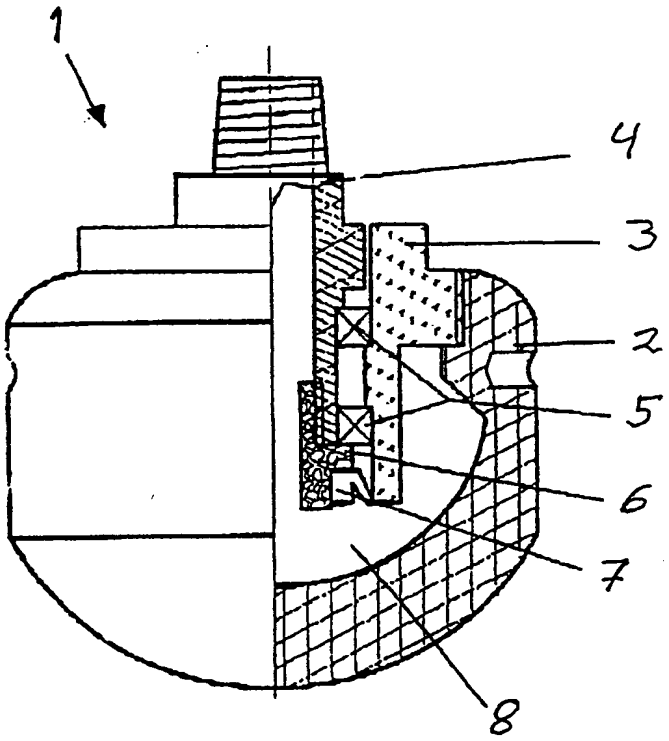

Fig. 1

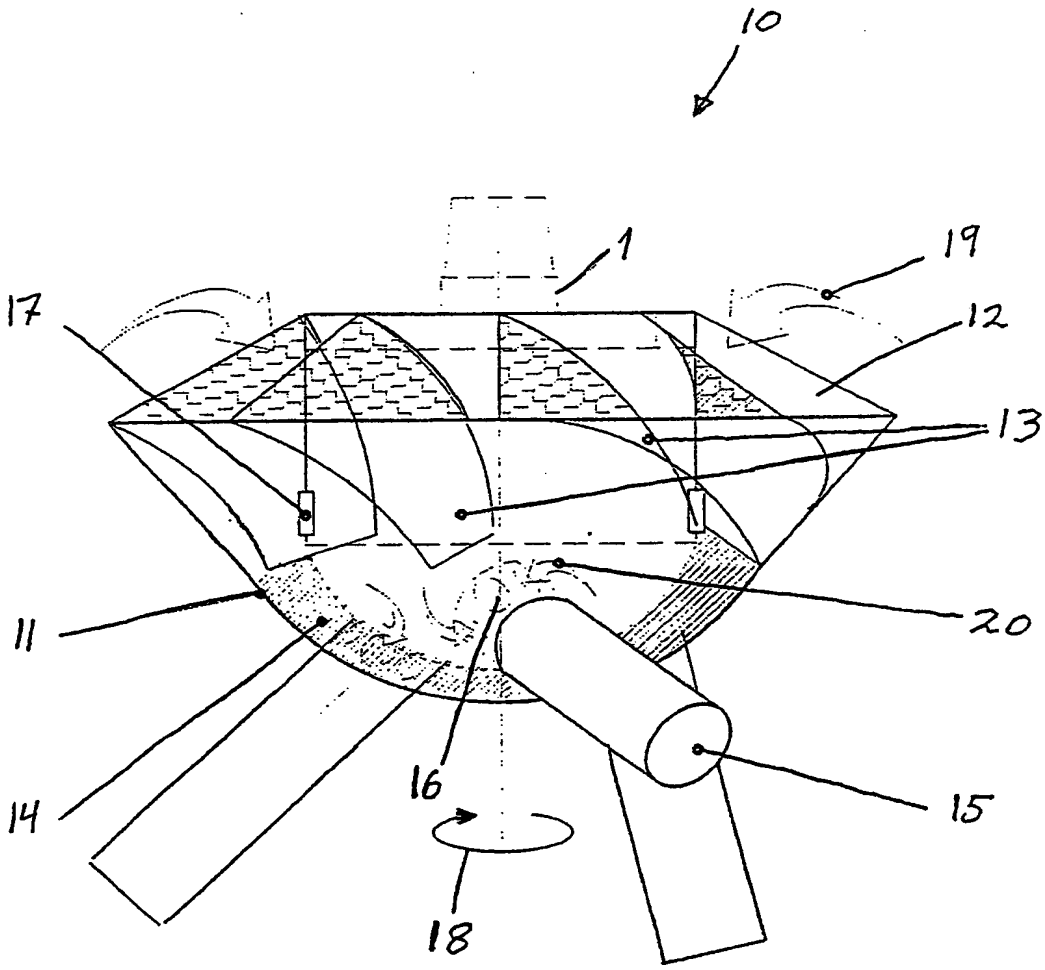

Fig. 2

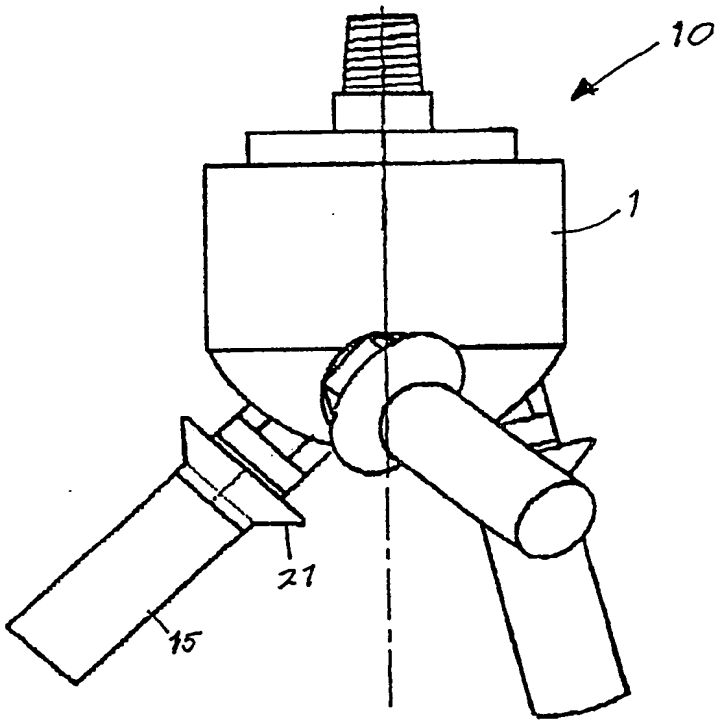

Fig. 3

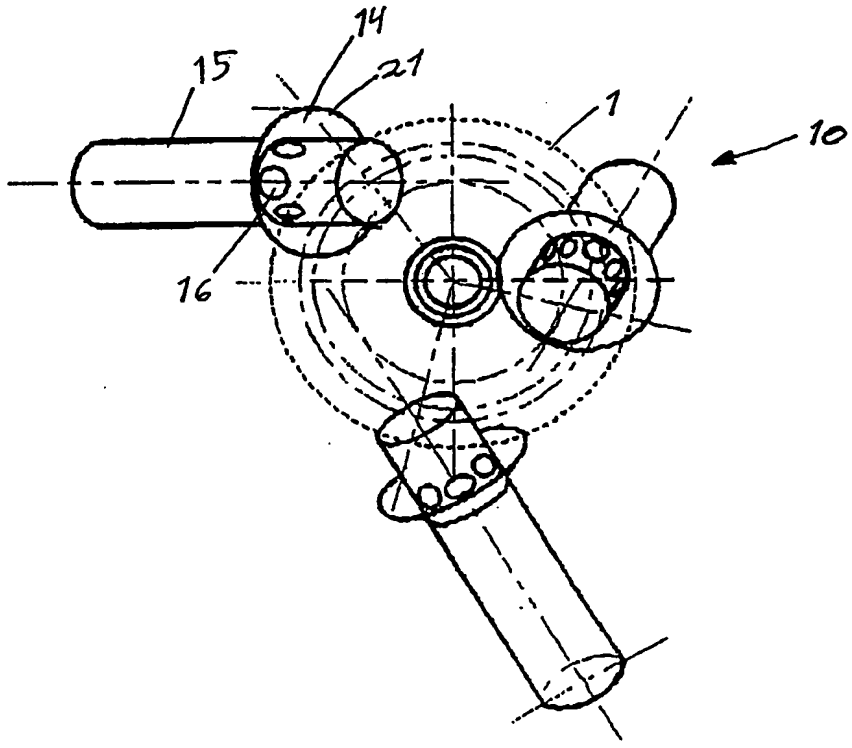

Fig. 4

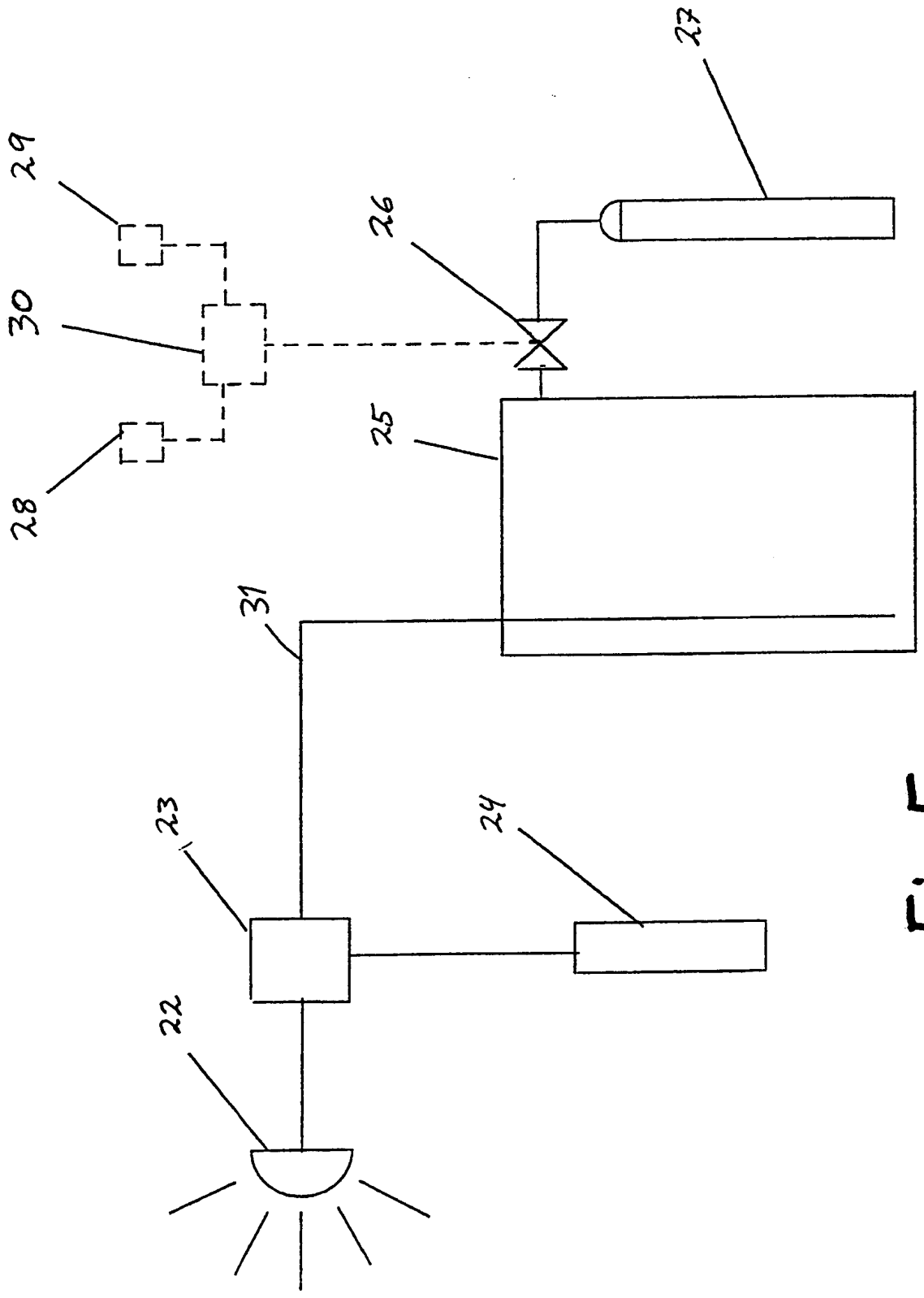

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A62C 5/02, B05B 1/34 // B05B A62C
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A62C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X,P	DE 19757654 A1 (FEUERSCHUTZ G. KNOPF GMBH), 24 June 1999 (24.06.99), column 2, line 61 - column 3, line 14; column 6, line 43 - column 8, line 30, figure 1, abstract	1-4
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Information on patent family members

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INTERNATIONAL SEARCH REPORT

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02/12/99

International application No.
PCT/NO 99/00253

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